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ABSTRACT

The study styles employed by a sample of Finnish university students were investigated. In the first study phase, 238 students described general study styles/approaches, using a questionnaire developed by Entwistle, which included 30 Likert-type items from the following dimensions: achievement orientation, reproducing orientation, meaning orientation, comprehension orientation (deep versus surface), operation learning, and pathological styles (improvidence and globetrotting). Most students were from four departments: education (86), business administration (57), computer science (35), and arts (45). Fifteen students were from other fields, including the social sciences. In the second research phase, 34 students were interviewed and completed the questionnaire about their studying habits in specific situations. The interview focused on students' activities in an independent study situation (e.g., when preparing for a test). Computer science students said they studied for exams mainly by attending classes and doing homework; they did not make conscious decisions about study procedures. However, most education students described their study strategies, which differed depending on the form of test they expected. Additional findings and conclusions concerning the questionnaire and interview methodologies are provided. A two-page list of references concludes the document. (SW)

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Styles of Studying in University

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Introduction

In the 1970's research activity concerning university students' study styles has widely expanded. Most of the recent interest in the research of study is due to the finding that academic learning not only results from instruction, but also from independent study. The ways and procedures which students use in studying may have a greater effect on learning than actual instruction. The research on study styles is also important for the reason that independent study is the main way of learning in the university environment.(see Rohwer 1984.)

Special attention has been paid in Europe to students' approaches to studying. These studies include Marton & Säljö (1976a, 1976b), Pask & Scott (1972), Pask (1976), Entwistle (1981), Entwistle et al. (1979a, 1979b, 1983). Related research has also been made in Australia by Biggs (1978, 1979).

Marton has examined the surface and deep approaches to studying. The basic distiction between these concepts is in the focus of the learner's attention. A student with the deep approach focuses on what e.g the text is about. He attempts to relate the parts of the text to each other, and works actively to find out meanings, making own conclusions, and being critical. The surface approach is quite the opposite. A student with the surface approach focuses on memorizing the text. He does not relate parts of the text to each other or the whole, and works passively, not using his imagination or creativity. (Marton 1983.)

In the studies by Pask, students' study styles were divided into three groups. The first was called comprehension learning, and the corresponding strategy was holistic. Students using this strategy seemed to concentrate on acquiring a general overview of the whole area before studying any details. The basic approach was to comprehend the area to be studied as a whole. The second approach was operation learning with a corresponding serialistic learning strategy. The serialist likes to learn the details, rules, and procedures, but does not focus on forming any general idea at the beginning of the learning process. Some of the students in Pask's studies were versatile learners who were able to use either of the strategies depending on the learning situation. (Pask 1976.)

Entwistle has investigated students' learning and study styles with the help of a questionnaire, which included items aimed at measuring e.g. concepts presented by Marton and Pask. According to the results, the students' approaches to studying could be described using four dimensions based on a factor analysis. The factors were interpreted: I meaning orientation, II reproducing orientation, III achieving orientation, and IV nonacademic orientation.

Biggs has used a questionnaire method in the research of study styles in the same way as

Entwistle. He also applies Marton's concepts in his questionnaire. The results of his studies indicate the existence of three study style dimensions (reproducing, internalizing, organizing), which seem to be related to the learning outcomes to some extent. (see Biggs 1978;1979; 1985.)

The questionnaire surveys have made a major contribution to the research of study styles. The results of these studies have offered an overview of the approaches and orientations students have in study situations. However, the methods have some serious limitations, as Rohwer (1984) has pointed out. The most serious limitation is the lack of specific contexts in the measurement of study styles. It is evident that students do not use similar approaches on different courses and in different subjects. The study styles and strategies may be relatively context dependent. However, it may be possible to study the styles from both directions, i.e., in specific contexts and generalizing over contexts. Both directions may require a different tool of analysis. Questionnaire studies seem to describe styles as relatively consistent over situations. Students may have the same basic orientation to studying in different situations, though they may use divergent activities in attaining their aims and goals. The actual strategies, i.e. students' actions in the specific situations, on the other hand, may be context-dependent. From this point of view we can assume that study styles are somewhat situation specific, like other traits (see Baron 1982; Bem & Allen 1974). The specificity seems to appear especially when the requirements of the academic departments compel the student to study for different objectives. (see Laurillard 1979.)

Study styles has been defined in various ways depending the objectives and methods of the research. For the purpose of this paper study styles are defined as typical ways of processing information and acting in learning situations. Study styles can be investigated at different levels of specificity. At the most general level style can be described as an orientation or approach to studies, whereas at the specific level styles are the actual procedures typically applied by the student in study situations.

Studying can be seen as a complex cognitive activity. It requires the construction of plans and making decisions which can be supposed to be based on the goals and the cognitive skills of the student and also the subject matter and context factors of studies. A skilled student has a complex knowledge structure, composed of interrelated schemata for study activities that are usually applied flexibly and with little cognitive effort in study situations. These activity schemata include structures at different levels of generality, with some global schemata such as overall orientation to studying, and more specific ones for smaller units of activity, such as studying a part of a textbook, or taking lecture notes. The idea that knowledge for skilled performance consists of schemata at differing levels of generality was developed originally by Sacerdoti (1977) and has been applied to different fields of cognitive processes, such as geometry (Greeno, Magone & Chaiklin 1979), programming (Soloway, Ehrlich, Bonar & Greenspan 1982), design of computer software

(Polson, Atwood, Jeffries & Turner 1981), and recently teaching (Greeno & Leinhardt 1983).

As a theoretical basis for the present research we can hypothesize that student s skilled performance requires the existence and operation of several knowledge systems. One is the knowledge of requirements of specific courses. The other is the knowledge of the content area and related schemata for understanding and acquiring new information to the schemata. To succeed in this effort a student needs special cognitive skills. The schemata for acquiring new information include appropriate thinking skills and also skills for controlling own activities, e.g. concentration in the study situations.

It thus seems important to consider both general and specific aspects of study styles. General approaches and orientations have been studied mainly using questionnaires. However, we do not know how well they describe the typical activities students actually use in the specific study situations. There are reasons for a critical attitude towards the information revealed by the questionnaires. More research is needed to gauge their validity.

In this study Entwistle's (1981) instrument for measuring study styles is used to examine the kinds of information revealed by questionnaire and interview methods. The research was aimed to answer, what kinds of styles students' use when studying, and what the factors affecting them. The approach in this research is mostly methodological. We need to compare different methods of assessing study styles.

Method

The study was carried out in two parts. In the first phase a questionnaire of study styles was developed and administered to a large group of students. The second part was carried out with a small group of students who were presented the questionnaire and interviewed about their approaches and procedures of studying.

The study was carried out at the University of Tampere, Finland. For the first study, 238 mainly undergraduate students from 4 different departments were selected. The subjects were participants of intermediate level courses at their departments, and were not sampled randomly into the study. The departments were Education (n=86), Business Administration (n=57), Computer Science (n=35), and Arts (n=45). In addition to these there were 15 students from other fields e.g. social sciences. The research was carried out to describe the general styles and approaches of university students to studying. The styles questionnaire was the one developed by Entwistle (1981) and included 30 Likert-type items from the following dimensions: achievement orientation, reproducing orientation, meaning orientation, comprehension orientation (deep vs. surface orientation), operation learning, and pathological styles (improvidence and globetrotting). All of the items in the questionnaire were translated into Finnish and 10 additional items were added to

secure the possibility of choice in case some of the original items did not measure the intended dimension. As a result of the item analysis the questionnaire was reduced to 30 items, which were used in the analysis of styles.

As a second phase of the research 34 students from the above departments were first interviewed and completed afterwards the questionnaire about their approaches and to studying and procedures they use in a specific situation. The interview was intended to investigate students' activities in an independent study situation, e.g. when students were preparing for an examination. During the interview students were asked to think about a specific study situation, which they could easily remember. The interview was carried out near the termination of the fall term, and each of the students had had at least one examination during the two weeks before the interview.

Questionnaire results

The items of the questionnaire were analyzed using normal procedures of item analysis, and the reliability of the measure was calculated using Cronbach's alpha. The coefficients for the different dimensions ranged from .53 to .67. There were also alpha values lower than the above (e.g. pathologies). These were not used in the further analyses.

The items of the questionnaire were factor analysed, yielding 4 oblique rotated factors. The factors were named as follows: I meaning orientation, II reproducing orientation, III extrinsic-intrinsic motivation, and IV achievement orientation. An example item of each dimension is given in Table 1. The factors were related to each other due to the rotation method. All the correlations were statistically significant. The correlations showed that students who were meaning oriented had also high score in intrinsic and achievement orientation. Students who had high value on the reproduction dimension were motivated by extrinsic factors and had not as high score in achievement motivation.

The factor analysis accounted for about 34 % of the total variance of the items. The percentage can be considered low. The low percentage might be due to problems of both validity and reliability of the questionnaire. The questionnaire was rather short, and some dimensions consisted only of about 4 - 5 items, which may be one reason for the reliability problems. The hypothesis made about the low validity is that questionnaire items did not mean and measure the same things for different students. While the items may fit well into the study styles and context for some students or student groups, they may be inappropriate for some others. Thus, for instance, the item about competing with friends, may be completely unfamiliar and irrelevant for students who are used to collaboration and joint efforts in studying with friends.

In spite of these problems, the results of the questionnaire were regarded as sufficiently reliable and valid for further analysis.

Table 1: Examples of items of the questionnaire.

I Factor (meaning orientation)

* I often find myself questioning things that I hear in lessons/lectures or read in books

II Factor (reproduction orientation)

* Although I generally remember facts and details, I find it difficult to fit them together into an overall picture

III Factor (extrinsic - intrinsic motivation)

* It is important to me to do things better than my friends, if I possibly can

IV Factor (achievement orientation)

* I'm usually prompt at starting work in the evenings

The styles of subject groups were compared to each other using the factor and dimension scores. The factor scores were calculated by summarizing the four items with the highest loadings on the factor. THe means of the scores were compared between the student groups, and the results are presented in the Table 2.

The results of the analysis of variance show that students have different approaches to studies. The difference is statistically significant in factors 1, 2, and 3 and, respectively, in dimensions B (reproducing orientation), C (comprehension learning), and D (meaning orientation). Some conclusions about the styles can be drawn. It seems that students of education are most meaning oriented of all, while computer scientist showed least of this orientation (I factor). In reproducing orientation (II factor) the largest difference was between the arts and other groups, with arts students showing least of this orientation. In the third factor, the computer science students seemed to be the most extricically motivated. Of the dimensions calculated on the basis of Entwistle's scoring schema the differences were largest on dimensions C and D. On the C dimension (comprehension learning), computer scientists scored lowest in the average whereas students of education had highest score on the dimension.

Table 2: Means of study style dimensions in the student groups.

	Educ. n=86	Bus.Ad. n=57	Comp. n=35	Arts n=45	F	Total n=223
I factor meaning or.	11.8	9.8	8.4	10.1	15.9***	10.4 s=2.6
II factor reproducing or.	8.2	8.1	7.8	6.1	3.7**	8.1 s=2.8
III factor ext.-intrinsic motivation	6.4	7.8	8.4	6.6	5.7***	7.1 s=2.7
Dim. A achievement or.	9.8	8.4	8.7	9.3	2.28	9.2 s=3.1
Dim. B reprod. or.	11.8	13.1	14.1	11.9	4.2**	12.4 s=3.8
Dim. C compr. learn.	12.7	11.5	9.8	11.3	13.5***	11.7 s=2.2
Dim. D meaning or.	15.4	12.7	12.8	14.4	6.7***	14.1 s=3.6
Dim. E operat. learn.	10.3	9.0	10.8	9.2	4.4**	9.8 s=2.5

($F_{.05} = 2.46$ *) $F_{.01} = 3.41$ ** $F_{.001} = 4.90$*** df1 = 4 df2 = 223

The direction of the results was similar on dimension D (meaning orientation). On dimension E (operation learning) computer scientists scored highest and students of arts lowest. The direction of this result is is similar to the previous studies by Entwistle (1981). The generalization of these results to any other group or generally to students at these departments is not possible, because the subjects were not sampled randomly.

The correlation between styles and learning outcomes (i.e., grades in the exams) was also a matter of interest. A statistically significant correlation was found between dimension A (achievement orientation) and grade in the last examination (the grade is shown in Finnish universities using the scale between 1 - 3). The correlation was r= .28 ($p<.01$). Also dimension B (reproduction orientation) correlated with grades, with r = -.23 ($p<.01$).

It is interesting to see how the results of a small group fit into the results of the first study. A second group was a sample of 34 students, and again, selected with a nonrandom way. As this data was collected about two years later,the same students were not available any more. The questionnaire was the same as before. The students were chosen from the same departments as in the previous sample. In the study the students were interviewed first and then asked to complete the questionnaire.

The dimensions of the questionnaire (mean scores) for each group are given in Table 3. The table shows that there were statistically significant differences between the groups in dimensions B (reproducing orientation) and D (meaning orientation). Arts and computer science students seem to be more surface oriented to reproducing their knowledge in the original form in exams. In the earlier study computer science and business administration students also scored highest in this orientation. In meaning orientation (D) business administration students had the lowest mean score, which differed from the other groups. In the earlier study this groups also scored lowest.

Table 3: Means of study style dimensions in the second study

	Educ. n=12	Bus.Ad. n=7	Comp. n=7	Arts n=8	F	Total n=34
I factor meaning or.	12.3	9.3	10.3	10.9	2.70	10.9
II factor reproducing or.	5.3	7.3	5.9	7.8	2.04	6.4
Dim. A achievement or.	7.5	7.9	10.3	9.3	2.28	8.6
Dim. B reprod. or.	7.4	11.7	9.0	12.0	4.16 *	9.7
Dim. C compr. learn.	13.3	11.9	11.9	12.0	1.08	12.4
Dim. D meaning or.	16.6	10.4	15.7	14.3	5.23 **	14.6
Dim. E operat. learn.	11.2	9.4	10.7	9.0	2.38	10.2

$F_{.05} = 2.92$ * $F_{.01} = 4.51$ ** df1 = 3 df2 = 30

As a summary we might conclude that the first study of a larger sample revealed significant differences in almost every dimension of the study styles. The reasons for differences are not evident, but we may hypothesize that there are basic differences in the motivation of students. Some students e.g., in the group of computer scintists and business administration may be more interested in the making of the degree and starting their career than learning of the subject matter, whereas education students seemed to be more intrinsically motivated. Intrinsic motivation resulted in the more meaning oriented approach to studies. Labor market situation is especially good for computer scientists and most of them start working before finishing their degrees.

There were also differences in a smaller sample which were consistent with the earlier results, but most of them were minor and not significant due to the small number of students. However, the consistency in the results between the departments, as regards different students might indicate that the styles measured were affected by the nature of the subject matter and the context of the studies. The study context for the latter sample of students may be considered the same as two years before. The consistency of the results provides at least some evidence for validity of the instrument.

Interview results

What is interesting from our point of view is the interview data. The differences and variations found in the questionnaire results showed the importance of further analyses of study styles. A more specific analysis was carried out using an interview method in which the student was probed to recall his/her study activities and procedures from the past study situations. The interview data can be regarded as a retrospective selfreport of one's cognitive processes. From the theoretical point of view it seems to be possible to recall events, actions, decisions and processes if they have been under conscious attention during the learning process. The retrieval process from LTM is supposed to be better if the student can remember a specific study situation and if s/he has made decisions and used procedures, which required conscious control. In conscious control situations the student uses STM as a store and encodes the results of the processes into the LTM. The memories of the specific processes applied may be accessible from episodic memory if the time interval between the actual situation and the time of recall is not too long. However if the student applies study strategies and procedures automatically, without conscious control, it seems plausible that they cannot be retrieved for verbal report (see Ericsson & Simon 1984). In the case of this study all students had recent experiences about study situations and it is assumed that their verbal reports of study procedures are based on the recall of past memories of study situations. However, the automatic control of study processes is a fact that may affect the verbal reports and should be

considered as a source of unreliability.

The interview questions concerned e.g. students' opinions about their study skills, their strategies and procedures in studying e.g. a textbook for an exam, and factors affecting their study habits in a specific study situation. The interviewer started by asking the question and tried to probe the student by asking more about the points the student had mentioned. The interviews were recorded and the main points of students' answers were transcribed from the tapes.

Study skills

The first part of the questions asked the student about the study skills to think about studying in general and then specifically their own subject matter courses.

The results showed that students did not make any difference between general skills and specific skills in their own fields of study. The answers to this question can be classified into three groups. The first group was formed by computer science students, most of whom made a remark of thinking skills as a basic requirement for studying. A typical answer was that studying requires logical thinking. In addition to this, most students listed another requirement, which was either concentration skill or some kind of persistence in studying.

The second group of students, students of arts (8), regarded the concentration skill as a basic requirement for studying. All but one of eight students listed this as the most important requirement. The second requirement was typically good reading skills or good memory. Half of the students regarded both of these as skills required most often in studying.

Students of business administration responded to this question exactly the same way as arts students. Most of them (5 out of 7) regarded the concentration skill as the most important skill for studying. Good reading techniques or skills were also mentioned in half of the answers.

Education students (12), contrary to the other groups, did not mention thinking or concentration skills when asked about basic study skills. What they mentioned was the skill of finding out the essential contents and figuring out the main points of the material to be studied.

As a summary we can conclude that the students in this research can be classified into three groups: 1) those who underline thinking skills as a basic requirement for studing, 2) those who emphasize the skill of controlling and directing overt behavior and actions in the study situations (concentration, persistence, reading techniques), and 3) those who underline learning skills (skills of figuring out what is essential and important to learn).

The fact that these groups are so identical with subject matter groupings suggests that the nature of the subject matter and departmental requirements have an influence on the students' study styles.

A related question was the question of students' own personal characteristics. In this question students were asked to list their good and bad characteristics as learners.

Computer science students had typically two bad characteristics in their minds. These were lack of diligence and lack of motivation for studying. Only one student added other characteristics to this list. The additional characteristic was lack of criticism to the study material.

Arts students listed the lack of concentration skills and lack of diligence (starting the preparations too late) or lack of skills of organizing their study schedule as their basic weaknesses. Business administrators listed few additional weaknesses, which were (for two students) poor memory or poor study techniques.

In addition to the characteristics listed above some education students mentioned difficulties in finding out the essentials from the text as their basic or most important weakness. The same categorizations can be applied to this question as to the first. However, the answers could not be grouped on the basis of the student's major subject.

When asked to list good learner characteristics students mentioned concentration skills, motivation, learning skills and some personal characteristics such as determination, and pedantic orientation which seemed to fit especially well to some subject matters.

Procedures applied in studying

Next asked students to describe their own procedures when studying for an exam.

Computer science students' descriptions referred mainly to the time of studying, nature of the subject matter to be learned, and general procedures and detailed descriptions of the study process. The procedures were slightly different in the other groups.

Most of the computer science students started their description by telling about the subject matter (programming for most of them). Most of them felt that the subject matter cannot be studied in a traditional sense, independently. It must be thoroughly understood, and for them understanding seemed to mean a dichotomous variable. You either understand or not. Studying is not linearly related to understanding from their point of view. A basic method of acquiring understanding was to attend lectures and demonstrations and do the homework. Half of the students told the interviewer that it was not necessary or even possible to study for an exam. Half of the students still did study for exams, but most of them started the preparation a day or two before the examination.

In verbalizing exact study procedures the overall feeling of the interviewer was that computer scientists' descriptions were rather 'lean', i.e., that they answered the question rather quickly, but did not elaborate their answers or were not able to tell much more in spite of the prompting efforts. This seemed to be a typical difference compared to the other groups. It also seemed difficult for

them to understand what was meant by the question and give their verbalizations accordingly. As an exact study procedure one of students told that he attempts to find earlier test questions and concentrates on studying them. One student mentioned that he concentrates on small parts of the material, while most students described attending classes as their basic method. Only two of the computer science students had studied a totally different subject matter as their minor subject, one of them administration. The preparation for the exam took about a month and was hard for him, because the course required learning a textbook 'from cover to cover'.

Students of arts described their study methods mainly using the same categories as the computer science students. Almost all mentioned that they started preparing for an exam about two days before, only one of them told that she usually starts about two weeks before. All of the arts students were from the language departments: English, German, Swedish, or translation studies. The nature of subject matter was mostly translations from Finnish into a foreign language (or the other way round), or vocabulary, grammar, and literature of the foreign language. One of the students said that it is impossible to prepare for translation tests and one mentioned that literature exams take much more time to study, because you have to know and understand the plot and themes of the text. The most typical study method for these students was trying to learn by heart. The rote learning method seemed especially good in vocabulary and grammar exams, because the test questions mainly required recalling detailed lists of simple facts or words. One of the students told that she attempts to learn and elaborate the material when attending a class.

When the interviewer attempted to probe more specific procedures most of the arts students told that they usually start by making a general overview of the material using lists of contents and titles and studying the most important parts first. Only one of the students told that she uses a self-questioning technique to check if she had learned. Another student had a more detailed procedure, which included an overview first, then making a schedule for studying, a detailed study of important material, and finally a recall and recapitulation of the main points.

Business administration students seemed to start their preparations earlier than other groups. Three of them started at least two weeks before, two about one week and three about 3-4 days before an exam. No comments about business administration as a subject matter were given to the interviewer. One student commented about a slightly different subject matter, business law, telling that it was so detailed and full of facts that it was hard to study.

The study procedures were mostly similar to those of the arts students'. Only two students told about information processing or learning processes as their first comment, others told about the number of times they read the material (once or twice), their aims (to pass the exam), methods applied to succeed in exams (finding out what kinds of test questions had been used earlier); or, that they have not thought about the methods they used. When given a speculative situation

(having to study a textbook independently) about a half of students gave a more detailed explanation. According to these explanations they would start by looking through the list of contents and titles, reading the text once or twice cursorily or studying for an examination on the basis of earlier questions. Most of the detailed descriptions also seemed to include a recapitulation of the main points as a way of checking the learning results. Compared to the other groups, the checking of learning was made more often by discussing the most important parts with a friend.

The students of education did not make any comments about the time of starting their preparations for an exam. They did not make any comments on the nature of the subject matter, either. But they did give more exact descriptions (as compared to other groups) of their methods and procedures in a typical independent study situation. It is very typical in education studies that students are required to study two or more textbooks for every exam, which they may have about four or five at the end of the term.

Education students seem to be better conscious of their study methods than the other groups. Most of them told that they first learned the most important parts and a general overview of the material. Some students mentioned that they distributed the time for the books (4-5 hours per book, studying two hours in the evenings, etc.). The next phase for most students was to tell about exact procedures they use to enhance learning. Some of the procedures used were making notes of the main points, writing the main points into the margins of the book, underlining, reading the text onto a tape and listening to the recording, making notes from memory after studying the book, studying a book independently and recalling it aloud with someone else, making questions to oneself, etc.. Almost every of the 12 students also had alternative procedures. Thus about a half of the students indicated a more surface oriented or rote learning approach in a situation in which they were not motivated to study or had not enough time. In case of the low motivation , one student told that she finds out earlier questions and concentrates on them. Further alternative strategies were, for instance, discussions with friends about the material, making questions to oneself, making notes using keywords, recalling the text using visual memories, and rote learning. One student told that he will not study at all if the course material is difficult. Instead, he attends the class and attempts to figure out what the course material is about.

The education students thus seemed to have more individual variation, at least in their verbalizations, than the other groups. This may be due to the familiarity of education students with the questions of learning. As a result of courses on learning and teaching, students become sensitive to their own procedures and can remember and verbalize them quite easily having paid attention to them in the actual situations. The verbalizations of study procedures seemed also to be more detailed and specific than in the other groups, and this fact also supports the idea of a better consciousness of one's own procedures.

We can summarize some of the differences between the groups by referring to the following variables: *time of starting preparations, general procedures used* and *accuracy of exact procedures reported.* As regards the time of starting the preparations, computer science and arts students reported the shortest periods for studies. Most students started only a day or two before the exam. Business administration students started at least 2 - 3 days before, and some as long as two weeks before. Only four of the education students mentioned the time of starting the preparation, and these seemed to be 'early birds', starting about 2 weeks before the exam.

General study procedures seemed to be related to the nature of the subject matter. This was sometimes a problem for the students themselves. The comments about the subject matter were probably due to the question not being appropriate for all students. The computer science students did not tell much of their procedures, apart from saying that most will attend lectures. Arts students seemed to take recourse to rote learning, as almost all reported this orientation as their general procedure. Business administration students had various general procedures, referring mainly to the number of times they read the texts or how much time they spent on reading.

Education students, unlike the other groups, reported more specifically about their procedures in attempting to learn a text. Most often this procedure included a general overview of the most important parts, then a careful reading, and finally a review followed by a recall of the responses to plausible exam questions. The accuracy of the methods showed clear differences between the education and other students, the former giving the most accurate descriptions.

Factors affecting study procedures

This question was presented to students after they had given a detailed description of their own methods. Almost all were able to answer without any difficulties. Three of the computer science students said that they had studied in the same way since high school already and that they could not give any details about the factors affecting their procedures. One student made the point that one has to know the style of the teacher to know how to study for an examination. His experience was that one succeeds by using earlier questions as an aid, because about a half of the old questions are asked again in the following exams of the course. Two students stated that the material to be studied (its structure and importance) is the major factor, and one student mentioned that the climate at the department had socialized him into similar procedures as those used by the other students. The most important factor for one student was lack of time for studying.

Students of arts did not differ in this respect. Five students (out of 8) told they had formed their styles already at school, and two mentioned the lack of skill of controlling their own concentration as a basic factor. Two students referred to the importance and a personal interest in the material,

and one to the lack of time for studying.

Business administration students were also quite similar. Three of the seven students told that their style was the result of the departmental environment, formed by the climate at the department or some other factors, which they could not specify. Two students told that they had formed the style at school, without being able to specify anything more. One student referred to the type of test questions as the most important factor of the study procedures.

The education students' seemed slightly different. More than half (of the 12 students) regarded the importance, difficulty and their own interest in the material as the basic factor affecting the procedures they use. Three students mentioned the type of the exam or the style of the instructor, two had personality characteristics on their list and two others mentioned the lack of time (lack of skill of scheduling one's work) and temporally varying factors. Each of the students listed at least two affecting factors, one as many as seven. No one mentioned anything about how long they had used these strategies.

With regard to this question the students can be divided into two groups, the first of which includes the computer science, arts and business administration students. The students in this group mentioned typically one (computer science and arts students) or two (business administration) affecting factors. The type of these factors was rather unspecific. For about a half of the students it was a statement about the origin (school) of the style. The other group is the students of education. This group seemed to be able to elaborate their first associations to the question and give a long list of affecting factors. Nevertheless, no one could tell any specific way or mechanism by which these factors influence on them. The data seems to show that many of these students were intrinsically motivated to studying, i.e. they were studying, not for grades or degrees, but to learn what they were interested in. This learning process seems to include a realization and consciousness of different learning styles in oneself.

The students were also asked about the requirements of learning at their departments. This question is related to the above discussion and was meant to give further information. For the computer scientists a basic requirement was the application of the information taught. This seems to be especially true in programming. Some variation was described between the requirements of different instructors at the same department. According to the students of arts, the requirement in language studies was most often a detailed repetition and recall of the facts by heart. Understanding or application of knowledge was not regarded as necessary to succeed in such examinations. Business administration students did not have any consistent opinion of the quality of the requirements. Some told that recall of details or facts was necessary, while others thought that comprehension and understanding of larger units as a whole was required. This last requirement was also mentioned by the education students.

Conclusions

The interview results show that there are differences between students' in their verbalizations of the study styles. The differences emerge both in the specificity and the content areas of the verbal reports. The differences may be due to the level of attention paid to the study procedures and strategies. For example, computer science students need not pay continous attention to cahnging their study procedures, because the nature of the subject matter and the requirements seem to remain similar and require specific procedures and approaches to studying. Almost all computer science students told that they study for exams mainly by attending the classes and doing their homework. They are not required to make conscious decisions of the study procedures, after having developed one, and this may be the key reason for the fact that they were not able to verbalize their procedures specifically. The opposite situation may exist for education students. Most of them produced extensive descriptions of their strategies. This might result from the fact that more attention is required for the control of actual study processes. While studying for an examination most of them have two or three textbooks to study, and they do not have enough time to study the area thoroughly. To accomplish what they can, they have to make conscious decisions of the areas they study and also of the strategies they apply to studying. The form of the expected examination may be used as a basis for choosing a corresponding study strategy. As a result of the process they are able to recall the strategies they used and also the contents of the study.

An important reason for the differences in the contents of the verbalizations might be that the nature of subject matter is a significant determinant of the study styles. If students were required to study the same kind of subject matter, they would probably develop similar strategies for studying, although there might be some interindividual differences. This assumption is based on what some computer science and business administration students thought about as their strategy if they were required to study a totally different kind of subject matter, such as business law or philosophy.

Discussion

In this paper we have examined students' study styles using both questionnaire and interview methods. The methods were intended to reveal what kinds of procedures and strategies students apply when studying independently e.g. for a course examination at their departments. A related question was about the factors affecting the styles of studying. The methodological question raised

in this study was about the correspondence and differences of the results of the two methods.

On the basis of the results we can conclude that the questionnaire and interview results can be used as supplementary to each other. Both methods reveal interesting aspects of the study styles. However, there are differences in the nature of the results. The questionnaire offers the results in quantitative form, in which differences between student groups may be seen in terms of the dimensions specified in the questionnaire. The specificity and interpretability of the results depends on the emerging dimensions. In this study the dimensions were somewhat general and did not give specific information about the ways of studying. The major limitation in the questionnaire approach seems to be that the items in the questionnaire did not correspond equally well to the study contexts which different student groups have at their departments. What seems to be a good questionnaire item for an education student may not be so good e.g., for a computer science student. The differences in the study environment also result in differences in the interpretation of the items. This is seen as a relatively high amount of random variance and unreliability in the results. If we want to take qualitative differences into consideration the questionnaire may not be the best method. The questionnaire can be sufficient, if we apply the method to a group with few interindividual differences and do not compare different groups to each other.

The interview method seems to be a better method for revealing qualitative differences in the procedures of the students. An important characteristic of the interview is that it can give students a possibility to describe their own views of the situation, giving information which the interviewer or the researcher cannot anticipate. If the questions are not too structured it is possible for the subject to describe his thinking of the topic using his own concepts and understanding of the situation. The analysis must essentially describe the concepts of the subjects, the content area of the information and the qualitative differences in the descriptions. It is difficult to express differences statistically, in terms of exact quantitative measures, but these are usually not essential in this approach.

The present results also seem to offer interesting implications for university instruction. Students of different subjects differed substantially in their study styles. The most important factor affecting differences was probably the nature of the subject matter studied, although few students verbalized this as an intervening factor. If students study only one kind of subject matter, e.g. mathematical subjects or foreign languages, it seems to be difficult for them to realize the differing requirements in different subject. If students study different subjects they may realize the differences in the requirements set for their own way of studying. The verbalizations require conscious awareness of the differences, and this is gained, if the student has to pay attention to changing his/her study procedures.

The implications for instructional psychology suggest the importance of developing students' environment for learning and studying. The study style and the quality of learning outcomes are likely to correlate, although we have not yet considered this question in more detail. What seems to be important is the use of different kinds of evaluation methods. In Finnish universities the major method for evaluation, at least in departments of education, is a written examination, containing essay questions, and students are required to respond on the basis of what they are able to recall. Using this kind of evaluation results in a recall-oriented reading in which attention is not paid, for instance, on criticizing or developing the author's points. Although there were differences between the student groups, their study style can be regarded as one-sided and restricted. If study styles are developed the outcomes of learning will also be more versatile.

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